Claims

[c1] What is claimed is:

1.A method for determining interface traps in a semiconductor/oxide interface of a MOS transistor comprising a bulk substrate, a source, a drain, a gate, and a silicon oxide layer beneath the gate, the method comprising:

grounding the bulk substrate, source, and drain;

applying a first gate pulse having a fixed low-level gate voltage (V_{gl}) and an increasing high-level gate voltage (V_{gh}) at a high gate pulse frequency on the gate so as to obtain a first charge-pumping current (I_{CP})-V_{gh} curve;

applying a second gate pulse having same low-level gate voltage (V_{gl}) and same increasing high-level gate voltage (V_{gh}) as the first gate pulse at a low gate pulse frequency on the gate so as to obtain a second I_{CP}-V_{gh} curve; and

subtracting the second I_{CP}-V_{gh} curve from the first I_{CP}-V_{gh} curve.

[c2] 2.The method of claim 1 wherein the second I_{CP}-V_{gh} curve is approximately equal to a leakage current component.

[c3] 3.The method of claim 1 wherein the silicon oxide layer has a thickness of less than 30 angstroms.

[c4] 4.The method of claim 1 wherein the silicon oxide layer has a thickness that is in a direct tunneling regime.

[c5] 5.The method of claim 1 wherein the high gate pulse frequency is about 1 MHz and the low gate pulse frequency is about 10^4 to 10^5 Hz.

[c6] 6.A method for testing a MOS transistor having an ultra-thin gate oxide layer, wherein the MOS transistor comprises a bulk substrate, a source, a drain, a gate, and an ultra-thin gate oxide layer disposed between the gate and the bulk substrate, the method comprising:

grounding the bulk substrate, source, and drain, wherein the source and the drain are electrically connected to each other;

applying a first gate pulse having a fixed low-level gate voltage (V_{gl}) and an increasing high-level gate voltage (V_{gh}) at a high gate pulse frequency on the gate so as to obtain a first I_{CP}-V_{gh} curve;

applying a second gate pulse having same low-level gate voltage (V_{gl}) and same increasing high-level gate voltage (V_{gh}) as the first gate pulse at a low gate pulse frequency on the gate so as to obtain a second I_{CP}-V_{gh} curve; and subtracting the second I_{CP}-V_{gh} curve from the first I_{CP}-V_{gh} curve so as to obtain a third I_{CP}-V_{gh} curve that is regarded as a real charge-pumping current curve at the low gate pulse frequency.

[c7] 7.The method of claim 6 wherein the ultra-thin gate oxide layer has a thickness of less than 20 angstroms.

[c8] 8.The method of claim 6 wherein the ultra-thin gate oxide layer has a thickness that is in a direct tunneling regime.